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COMMUNICATIONS

THE FOURTH CRANIAL NERVE*

BY

J. HERBERT PARSONS

LONDON

THE fourth cranial nerve is an unsolved riddle. It is the only nerve which has a dorsal decussation, that is to say, in the complete sense of the term. Of course, we are familiar with the fact that motor nuclei are connected with other nuclei on the opposite side of the central nervous system, e.g., the motor cells in the anterior cornua are connected with the opposite side of the spinal cord by decussating fibres. But the case of the fourth nerve is totally different, in that its fibres pass out of the central nervous system to a muscle on the opposite side of the body.

This nerve seems to be unique in the central nervous system. The other nuclei dealing with ocular muscles show variations of the ordinary type of decussation. The sixth nucleus probably has comparatively few decussating fibres; the third nucleus has a considerable number in the posterior part. But with regard to the fourth, it is probable that there are no decussating fibres within the central nervous system other than those which pass out in the trunk of the nerve. The diagram of the third and fourth nerve nuclei (Edinger,[1] I., Fig. 171) taken from Bernheimer, of all the varieties which Mr. Paton showed us some time ago, probably represents the condition better than any other, or most other, of

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the theories. Another peculiarity of the fourth nerve is, that it is essentially somatic in mammals, that is to say, it supplies purely somatic muscles; it has no visceral fibres : but this requires further consideration, as I hope to show later on.

Little assistance in solving the problem is afforded by disease in man, not only with regard to the fourth nucleus, but also other motor ocular nuclei, owing to the absence, so far as I can find in the neurological literature to which I have had access, of information of definite nuclear lesions, proved pathologically to be so. Consequently it is very difficult to get any information from pathological sources, such as one gets in regard to other lesions of the central nervous system, as to the conditions which occur as the result of purely nuclear lesions.

Another point is the absence of experimental lesions in this neighbourhood sufficiently exactly localised to produce definite results. Practically it is an inaccessible part of the central nervous system from the experimental point of view, and nothing but Clark's apparatus would succeed in producing lesions sufficiently well defined for one to obtain good results from experimental lesions, and the literature of the subject gives us but little help. Therefore the explanation must be sought in comparative anatomy and embryology.

Comparative anatomy.—With regard to comparative anatomy, it is extraordinary that the fourth nerve exists right down to the very beginnings of the vertebrates. It is present in the lowest group of fishes, the Cyclostomata, as, e.g., in the lamprey (*Petromyzon*). It is even represented in *Myxine* (the hag fish), in which the eyes are in a very degenerate condition, and the sixth nerve is absent. The fourth nerve, therefore, is represented throughout the vertebrate series, and in all it decussates dorsally, passing through the anterior medullary velum, exactly as in the highest mammals. Hence, phylogenetically it is a very primitive nerve.

Figs. 1-3 are derived from the excellent work of Davidson Black,[2] a pupil of Ariëns Kappers, and show the position of the nuclei of the cranial nerves, and the points of exit of the nerves from the central nervous system in the various groups of vertebrates. The diagrams illustrate a transparent view of the anterior part of the central nervous system. They show the third nerve and third nerve nucleus, the relation of the fourth nerve, and so on, throughout the different species. In fishes, the fourth is close up to the third; in the Dipnoan fishes there is an approximation between the fourth and the fifth.

Many interesting points have been brought out by Davidson Black's laborious researches, but time does not permit me to enter into details. One point of interest may be mentioned, viz., the starting of Deiter's nucleus, and the extremely near relationship

there is between the sixth nerve and Deiter's nucleus. On some future occasion it would be instructive to consider the sixth nerve and its relations to Deiter's nucleus, the vestibular nerve, and the cerebellum; i.e., the relationship of the sixth nerve to the co-ordination of movement, with special reference to tonus and posture.

A point which comes out of Davidson Black's and other allied investigations is one which is not immediately related to the fourth nerve, but which throws some light on it; viz., the division of the third nerve nucleus into sub-groups of cells. We are familiar in man with the very definite sub-grouping of the nerve cells in the third nucleus. In the lowest species the third nucleus forms one scattered group of nerve cells, not gathered together into specific groups; but when we consider the species in which specific grouping occurs, we find a somewhat unexpected distribution. The differentiation of the third into sub-groups is found in ganoid and teleostean fishes, but not in selachians and dipnoans. The Dipnoi are fishes with lungs as well as gills, and they form a sort of bridge to the amphibia. The sub-grouping is found to persist in anuran amphibians, reptiles, birds and mammals. Consequently this particular grouping is of some importance, and tends to show, as Davidson Black points out, that this differentiation is a late feature, and is not explained by the straightforward trend of phylogenetic evolution. Thus, this author says: " It would thus seem probable that the factors which determine the anuran oculomotor cell arrangement must have appeared comparatively late in phylogeny. The eyes of most fishes are normally focussed for near objects when at rest, and since the eyes of most amphibians, reptiles, birds, and mammals are normally focussed for distance (Beer), it is not improbable that the chief original cause of the amphibian oculomotor nuclear specialization may be seen in the readjustment of the mechanism of accommodation which must have taken place in phylogeny during the evolution of the amphibian type." (Davidson Black[3].)

This brings out a very important point, much emphasized by Kappers in his theory of neurobiotaxis. As his pupil, C. J. Herrick[4] says, " Functional differentiation in the phylogeny, as in the ontogeny, began at the periphery; and here the elaboration of functionally specific end organs and conduction paths advances much more rapidly on the sensory side than on the motor side of the reflex circuits. At an early stage when all the sense organs and afferent nerve components are differentiated substantially as in the adult the motor mechanisms of the spinal cord and nerves may show very little evidence of capacity for diversified response, simple swimming movements toward or away from the source of the stimulus being almost the only possible reactions. In other

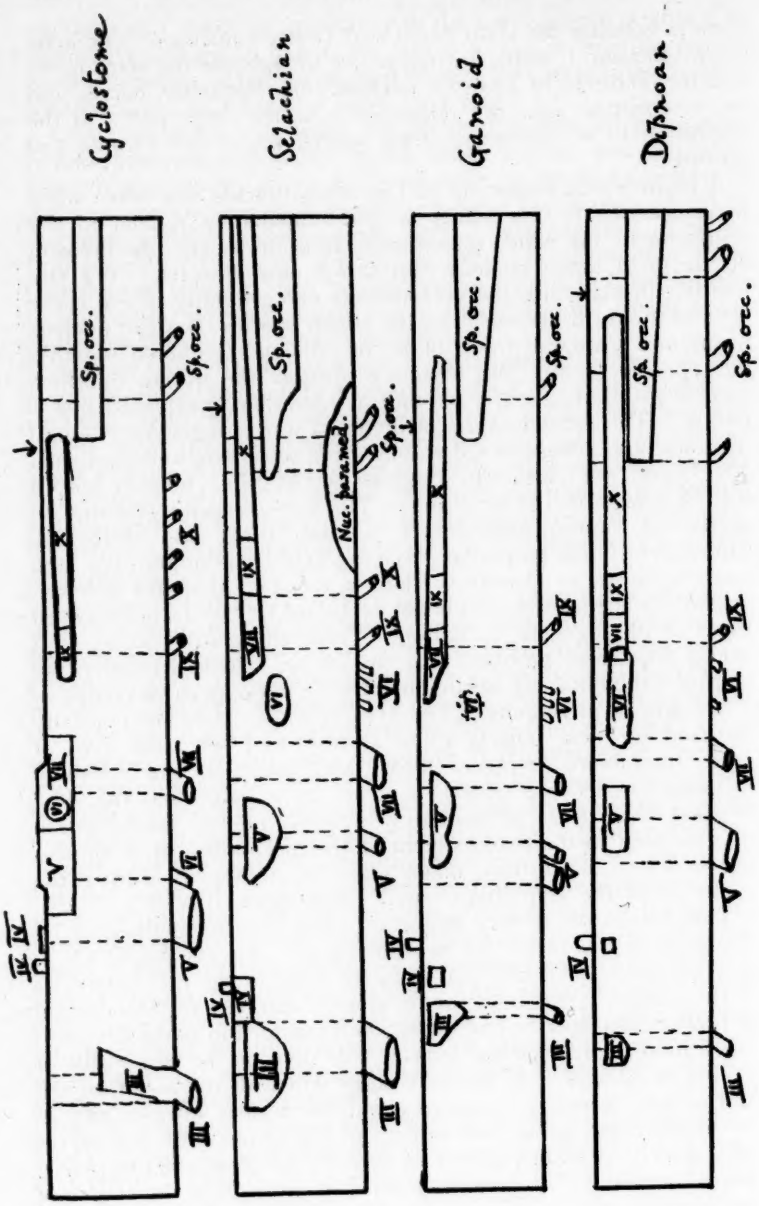

FIG. 1.—FISHES. (*After* Davidson Black).

words, the elaborately diversified receptor mechanisms converge into a very simply organised final common path."

I lay special stress on these points, because they support Kappers' theory of neurobiotaxis. According to this theory, the migration of motor nuclei is especially associated with a chemotactic force. The nucleus is attracted to the foci of the specific afferent impulses for which the given motor nerve provides the final common path. The theory is extremely attractive, and Kappers and others have attached great importance to it; but we must be on our guard against using it as a *deus ex machinâ* in problems of difficulty. Thus, Sir Arthur Keith, in the last edition of his Human Embryology, "explains" the riddle of the fourth nerve by neurobiotaxis. He does not, however, venture to elaborate the steps of the explanation. The theory does seem to afford some explanation of the mesencephalic situation of the third and fourth nuclei. These nuclei are morphologically serial with spinal hind brain somatic motor nuclei, and their displacement forwards may be attributed to the increasing preponderance of the head segment as the site par excellence of the projicient sense organs, and above all, of the eyes.

Embryology.—In 1881 Milnes Marshall [5] pointed out that the ocular muscles were derived in Elasmobranchs (sharks and rays) in the following way: The muscles associated with the third nerve came from the first or pre-mandibular head cavity; the fourth nerve muscles came from the mandibular head cavity; and the sixth from the hyoid. This may be the case in fishes, but it is very difficult to get definite evidence with regard to these points in higher mammals, because in the highest mammals either head cavities do not exist, or are very transient, and it is very difficult to locate the different muscles. Figs. 4-8 are diagrams of Miss Platt's work[6] on the Elasmobranchs, and show how these muscles are developed in the shark (*Acanthias*). Fig. 4 represents the anterior part of an embryo, 6 mm. in length, and the anterior part of the foetus is towards the right; *a* is a cavity anterior to the premandibular cavity, which forms, then atrophies, and disappears; no satisfactory explanation of this cavity has been advanced. 1 is the first or pre-mandibular head cavity, which gives rise to all the muscles supplied by the third nerve; 2 is the second or mandibular, giving rise to those supplied by the fourth; 3 is the third or hyoid, giving rise to the muscles supplied by the sixth nerve. Note the posterior prolongation of 2, forming a large mandibular muscle; so that in addition to forming the basis of the superior oblique, which this head cavity forms, it also forms a mandibular muscle, emphasizing the association between the superior oblique and the mandibular arch.

Another point of great importance is the minute association, at

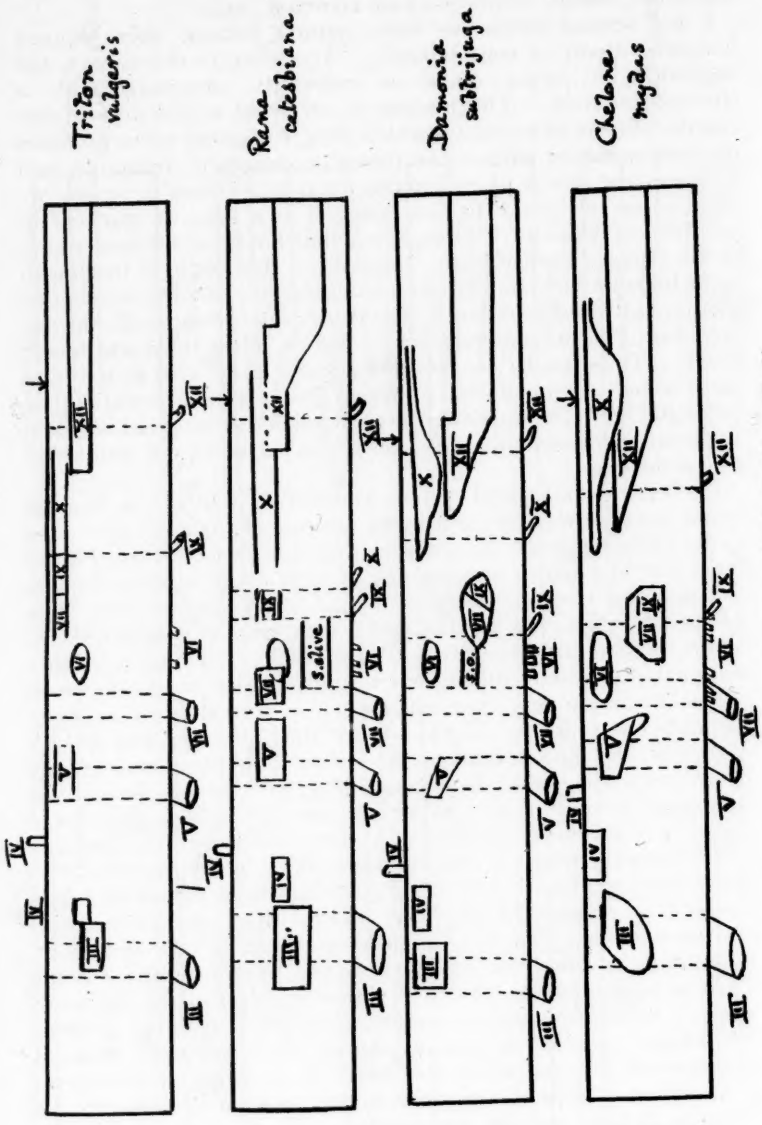

FIG. 2.—AMPHIBIA. (*After* Davidson Black).

an early stage, of the fourth and fifth nerves; *c.g.* is the rudimentary ciliary ganglion, formed apparently by both fourth and fifth nerves.

Fig. 5 is the next stage, 12mm.; *a* is still existent, but it entirely disappears subsequently; 2 gives signs of forming the superior oblique; the large mandibular muscle is still developing. There is very closely associated with this cavity a branch of the fifth (V *an*), with which the fourth nerve anastomoses in the shark. The very near relationship between the fourth and fifth nerves is thus further emphasized. The external rectus is being formed from 3, and the sixth nerve is seen passing into it.

Fig. 6, of a 16 mm. embryo, shows the development of the inferior oblique (*inf. obq.*). The superior oblique (*supr. obq.*) is well developed.

In Fig. 7 the inferior oblique is definitely formed, the foremost head cavity *(a)* still persists; the superior and inferior recti are becoming differentiated, and the large mandibular muscle has atrophied and disappeared.

The best confirmation of these observations on Elasmobranchs in their relation to higher vertebrates is the work of Miss E. A. Fraser[7] on marsupials. This work is of great importance, as is shown by the following quotation (*loc. cit.*, p. 341):—

"The abducens complex and the m. obq. supr. are difficult to identify in our earliest stages, but by comparison with slightly older embryos it is possible to make out their contours in the surrounding mesenchyme from which they are not easily distinguished. In our first stages, up to 8.5 mm., the primordia of both these muscles are united with the maxillo-mandibular mesenchyme by an intermediate mass of more loosely-connected cells, the position of which is well seen in Phascolomys (wombat) (text fig. 21, p. 332). The m. obq. supr. arises from this intermediate mass as an upgrowth which extends forwards above the eye, the intermediate mass itself apparently degenerating. In the rabbit Edgeworth (1903) regards the m. obq. supr. and the m.rectus ext. as "specialised portions of the mandibular and hyoid myotomes, which separate, the former late, the latter very early in development, from the upper ends of their respective myotomes" (p. 82). In Chelydra (a tortoise), according to Johnson (1913), the m. obq. supr. (p. 159) "grows forward as a stream of cells from the dorsal portion of the mesenchymal cell-mass, which results from the second head somite," the ventral portion of the latter at the 5 mm. stage being in close contact with the mesoderm of the mandibular arch. If we compare these conditions with those in Trichosurus, Phascolarctos, and Phascolomys, we may conclude with some probability that the intermediate mass answers to the second somite of the head whose cavity is already obliterated, or in which the

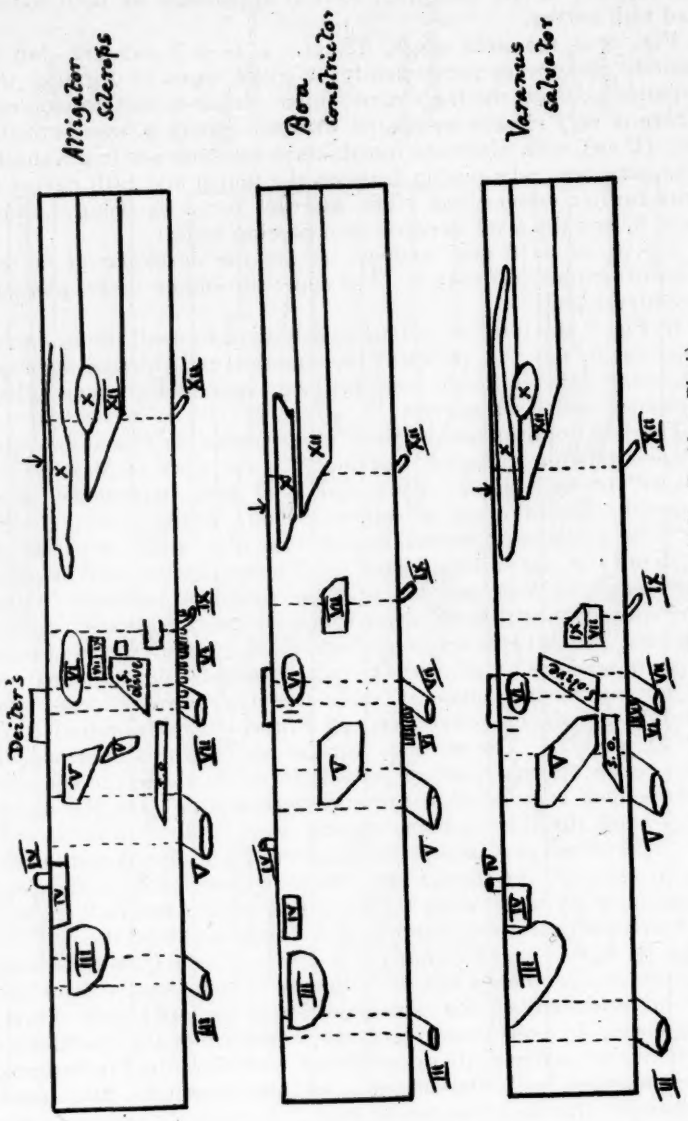

FIG. 3.—REPTILES. (*After* Davidson Black).

cavity has never developed, and from whose dorsal region the m. obq. supr. takes its origin. In Chelydra also, at a certain stage in development, the identification of the second somite is a matter of some difficulty. In the embryo of 7 mm. Johnson says (p. 142):—"The second head somite of the 7 mm. stage is of such indistinct and indefinite form that it may easily escape notice. It reaches here the most obscure phase of its development. The more or less conspicuous cavities of earlier stages have collapsed and broken down, and with their disappearance the cells of their walls are with difficulty distinguished from the intruding and intermingling mesenchymal elements."

No cavity is seen in the abducens muscle-mass, which in our earliest embryo is quite solid and shows a temporary attachment, as above mentioned, to the intermediate mass, this connection

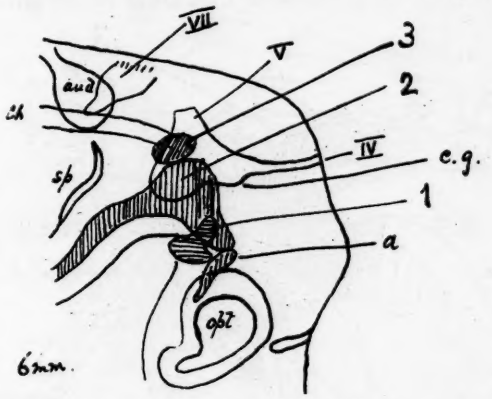

FIG. 4. (*After* Miss Platt). *aud.*, auditory vesicle; *ch.*, notochord; *c.g.*, ciliary ganglion; *opt.*, optic vesicle; *sp.* spiracular cleft.

being probably a secondary phenomenon as in Chelydra, where it also occurs. It is possible that the intermediate mass, i.e., the second somite, may contribute towards the formation of the m. rectus ext, as in some fishes (Dohrn, 1904, Neal, 1914), but we have no direct evidence of this in Trichosurus. The m. rectus ext. and m. retractor bulbi develop exactly as in Chelydra; the origin of the m. retractor bulbi bearing no resemblance to that of the pig, where, according to Reuter (1897), p. 376:—"Dieser Muskel ensteht aus dem inneren Mantel des Augenmuskelkelches durch Abspaltung von vorn nach hinten."

In Chelydra, however, the m. retractor bulbi separates off from the m. rectus ext. at an early stage, before the second somite has completely degenerated, and when the m. rectus infr. and int. first begin to differentiate from each other, whereas in Trichosurus

it only becomes an independent muscle at 17.5 mm., after the other muscles of the eye have assumed their final positions, and at a time when the m. rectus infr. and int. are almost completely separated. The m. retractor bulbi in both animals is the last of the eye muscles to reach its adult position.

The cranial nerves, three, four and six, arise from the brain and grow towards their respective muscles, their connection with the mesodermal somites being a secondary one, as shown by Neal (1914). No independent origins in the muscles themselves are present as described by Filatoff (1907) in Emys lutaria (a tortoise). The oculomotor runs at its distal end into the proliferation on the postero-lateral wall of the head cavity and breaks up into many fibres at the region where the m. obq. infr. and m. rectus infr. first grow out, these two muscles being innervated at precisely the same time; later, at the earliest indication of the m. rectus int.,

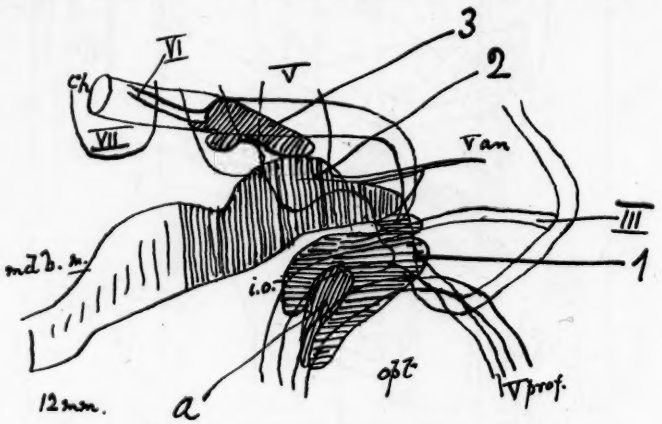

FIG. 5. (*After* Miss Platt). *mdb.m.*, mandibular muscle.

fibres are seen to run into the root of the latter. The abducens develops in the typical manner and runs into the posterior end of the abducens muscle-mass; when the m. retractor bulbi grows forwards and separates off from the m. rectus ext. the nerve branches into the two muscles at the point where the former crosses the medial side of the latter. The trochlear, as is usually the case, arises later than the other two nerves. In Trichosurus it first appears at 8.5 mm. and does not reach the m. obq. supr. until 11 mm., when it penetrates into the posterior side of the medial end of the muscle."

The chief points I want to bring out here, apart from the distribution of the eye muscles according to the branchial arches, is the near association of the fifth nerve, both in the origin of

the fourth and fifth nerves, and also in the relationship of their branches at a very early stage in development, and the relationship of these branches to the ciliary ganglion.

The ideal segmental nerve consists of a number of different parts: Motor somatic, sensory somatic, motor visceral, and sensory visceral. Both motor somatic and motor visceral fibres in the spinal region pass out of the cord by the ventral roots, being derived from cells in the anterior and lateral horns respectively. The cells of origin of both sensory somatic and sensory visceral fibres are in the dorsal root ganglia in the spinal region. In lower vertebrates the motor visceral fibres supply not only the viscera proper, but also the muscles of the branchial clefts, which are essentially respiratory, and therefore visceral in function. In

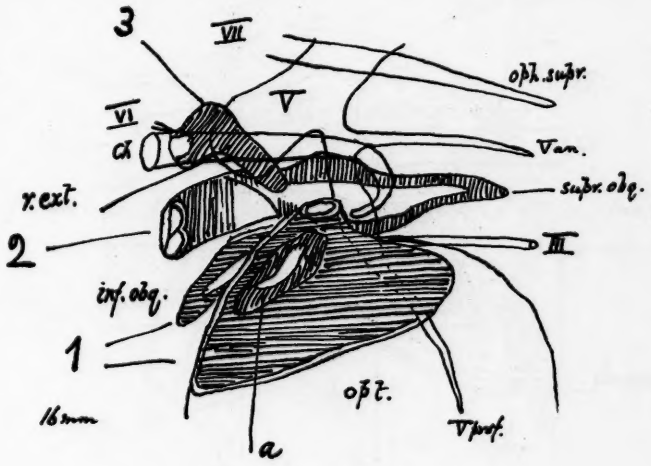

FIG. 6. (*After* Miss Platt).

higher vertebrates many of the branchial muscles lose their visceral character and assume all the characteristics of somatic muscles, as, e.g., the pterygoids, trapezius, sterno-mastoid, etc. Their nerve supply is the chief criterion of their visceral origin. Thus it comes about that a nerve originating in lateral horn cells or their homologues in the brain stem appears to supply ordinary somatic muscles, e.g., the motor part of the fifth nerve. It is unnecessary to consider other complications, such as the nerves associated with the lateral line organs in fishes, since these complications affect especially more posterior regions, viz., the eighth nerve system.

The observations of Froriep, Kupffer and others prove that the third, fourth, and sixth nerves are not quite so simple as we are

accustomed to regard them. In some Elasmobranchs, e.g., the electric fish Torpedo, the fourth nerve has a ganglion developed upon it—in fact, two ganglia, and the third nerve also has one (Cf. Edinger,[1] II., Fig. 9). The interesting point is the different morphology of these ganglia. The ganglion on the third nerve is due to a migration of motor nerve cells from the neighbourhood of the third nerve nucleus down the course of the nerve; and there is no doubt that these cells enter into the formation of the ciliary ganglion. They are motor cells, and they represent the motor visceral part of the third nerve. Hence the third nerve is not only motor somatic, but motor somatic *plus* visceral. On the other hand, investigation of the chief ganglion on the fourth nerve

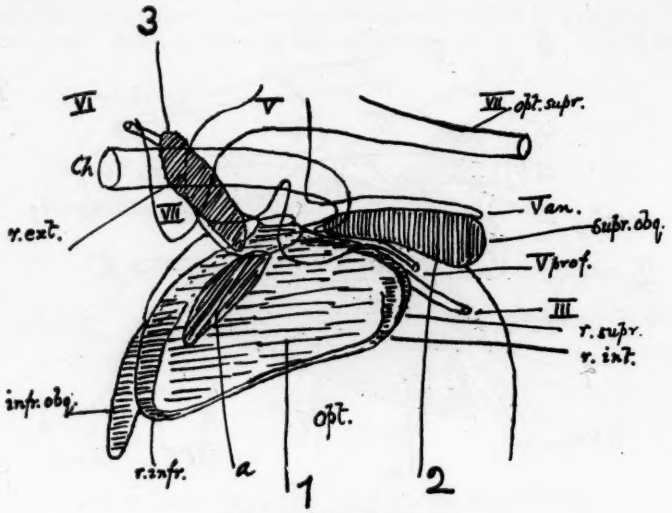

FIG. 7. (*After* Miss Platt).

shows that it does not migrate from the neighbourhood of the motor nucleus, but develops from cells which originate in the neural crest, i.e., the ganglion develops exactly like the dorsal root ganglia of the spinal cord, so that there is no doubt that this ganglion on the fourth nerve is a posterior root ganglion; and therefore, at this stage, the fourth nerve has at any rate motor somatic fibres *plus* sensory somatic fibres or sensory visceral fibres as well. Possibly the second ganglion on the course of the fourth nerve in the Torpedo embryo represents a motor visceral part; in any case it atrophies. Therefore this nerve is not as incomplete in the early stages as in the later.

The differences between the third, fourth and sixth nerves are

interesting. The third has motor somatic and motor visceral fibres, the latter going to the ciliary ganglion; the fourth has motor somatic which persist, and sensory somatic (and (?) both motor and sensory visceral), which atrophy; and the sixth has motor somatic which persist, and motor visceral which atrophy. So that we have, in the embryological stages, some indications of the composite nature of the fourth nerve, representations of other fibres which bring it more into line with any other ordinary segmental nerve.

I wish to draw attention to the relationship of the fourth with the fifth nerve. I have pointed out, briefly, the minute relationship between them in their early origin; but there is also a near

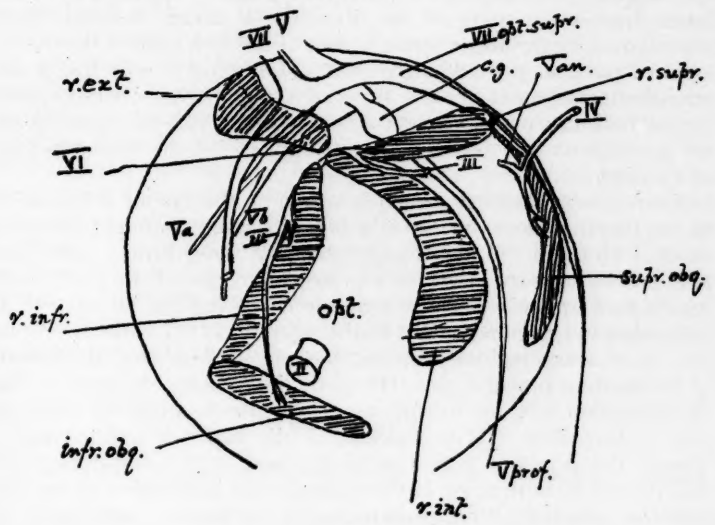

FIG. 8. (*After* Miss Platt).

relationship between certain parts of the fifth and the fourth in late stages. Sections of the mesencephalon throughout the vertebrate series show a remarkably constant relationship between the nucleus of the fourth nerve and a group of smaller cells which undoubtedly belong to the fifth nerve, and are known as the mesencephalic nucleus of the fifth. The relationship of the mesencephalic root of the fifth to the fibres of the fourth is so close that some observers (e.g., Davidson Black) think that some of the fibres actually join the fourth nerve.

Much discussion has arisen with regard to the nature of the mesencephalic root of the fifth. For instance, in Schäfer's

Physiology Sherrington has depicted them as motor fibres. In Quain's Anatomy Schäfer has depicted them as sensory fibres. The position of the fourth nucleus corresponds with that of other motor somatic nuclei, homologous to the anterior horn of the spinal cord; that of the mesencephalic nucleus of the fifth, slightly lateral to the fourth, corresponds with the motor visceral nuclei, homologous to the lateral horn of the cord. The question arises, therefore, whether this part of the fifth does not represent the motor visceral part of the segmental nerve of which the fourth is the motor somatic part. The nerve of the mandibular arch would then be made up of: (1) a motor somatic part, represented by the fourth; (2) a sensory somatic part represented by the fourth, with its ganglion, which atrophies, and now possibly replaced by fibres from the sensory part of the fifth; (3) a motor visceral part, represented by the mesencephalic root of the fifth; and (4) a sensory visceral part, at present unknown. The somatic muscles of the mandibular segment are the superior oblique which persists, and the mandibular muscle which atrophies; the visceral muscles are the pterygoids and other muscles supplied by the motor branch of the fifth.

There is no satisfactory explanation of the dorsal decussation of the fourth nerves, but several ingenious suggestions have been made. Hoffman [8] in 1889 suggested that the trochlear nerve was originally a sensory nerve for a protecting organ of the pineal eye, which subsequently became a motor nerve for the lateral eye as the pineal eye degenerated. Fürbringer [9] in 1897 considered that the nerve was originally motor, associated with the movements of the median pineal eyes. He made the striking suggestion that the decussation is due to shifting of the muscle supplied from one side to the other. The ancestor of the superior oblique was a muscle the fibres of which were attached to the mid-dorsal line and interlaced with those of the opposite side, the two muscles thus forming an arch through which the nervous system with its central canal passed. Gaskell[10] found such a pair of muscles in the anterior dorso-plastron muscles (Miss Beck) of the scorpion, corresponding with similar muscles in fossil arthropods, e.g., Eurypterus, and fossil fish with head shields, e.g., Cephalaspis. He held that the ancestors of the eye muscles of mammals are to be found in these dorso-ventral muscles of arthropods, which have been brought into the service of the lateral eyes as these have replaced the median eyes in the course of evolution. The ingenious working out of this theory, which fits in remarkably well with Gaskell's theory of the origin of the vertebrates from arthropod ancestors, must be sought in Gaskell's book (esp. pp. 263-279). It must be borne in mind, however, that Gaskell's theories have not found favour with zoologists.

One other point which I wish to emphasize deals with the synergic activities of these motor ocular muscles. We have seen that the third, fourth and sixth nerves are built on exactly the same plan throughout the vertebrates, down to the lowest. It is clear that the synergic activities of these muscles must vary enormously from species to species. Neurologists have made us very familiar in man with the pre-eminently synergic control of lower motor neurons by the cortex cerebri. Now, if the brains of the vertebrate species are compared with each other, we find that in all there is a palaeencephalon—the corpus striatum; but in the lowest fishes there is no neoencephalon, the roof of the fore-brain consisting simply of an epithelial membrane. Even when the pallium first appears it is in direct relationship with the olfactory system and probably has little to do with the visual apparatus. Yet in all these animals the eye movements are coordinated, and are correlated with body movements. These synergic activities must be brought about by complex decussations and interrelations between various motor nuclei, and there must be some mechanism for their co-ordination. Doubtless these phylogenetically older co-ordination mechanisms become in turn controlled by higher cortical mechanisms in higher species as these eventually appear and increase in importance—and it is with these that we are most familiar. We should not, however, forget the lower any more than we neglect the lowest and middle level mechanisms. This is not to derogate from, but merely to elaborate Hughlings Jackson's ideas. He himself would probably have been the first to admit the division of his highest level into substrata.

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A NEW TECHNIC IN PUNCH FORCEPS SCLERECTOMY FOR CHRONIC GLAUCOMA: TANGENTIAL AND EXTRALIMBAL IRIDENCLEISIS OPERATIONS EPITOMIZED 1915-1919*

BY

S. HOLTH

CHRISTIANIA

THE many cases, published by various authors, of late infections after limbal sclerectomy, especially after sclero-corneal trephining, where, according to American operators, late infection occurs in about 7 per cent. of the cases (Lit. 8) induced me in 1915 to take up again two (Fig. 1 and 3) of the numerous† iridencleisis operations which I performed during the years 1904 to 1908 (Lit. 1, 2, 3, 4, 7, 11 and 12). In both of these operations a subconjunctival tunnel is made to the limbus previous to the limbal keratome incision, either with scissors, or, still better and more elegant, with

FIG. 1.

Iridencleisis simplex: used only in cases which have had an iridectomy previously performed.

the keratome itself (Lit. 3, Fig. 4), producing the subconjunctival tunnel during its progress into the anterior chamber.

A. *Iridencleisis simplex*: is used only in cases in which an iridectomy has been previously performed. The periphery of the iris at one border of the coloboma is drawn a little into the subconjunctival wound at one angle of the keratome incision (Fig. 1).

* Read at the Oxford Ophthalmological Congress, July 16, 1920, and at the Fifth Scandinavian Ophthalmological Congress at Stockholm, August 29, 1921.

† In Grimsdale and Brewerton's "Textbook of Ophthalmic Operations," Second Edition, 1920 (Lit. 10, p. 273), the following just observation is made about my paper of 1907 called "Iridencleisis antiglaucomatosa" (Lit. 3), "it gives so great a variety of methods that it is hardly possible to describe one single plan as Holth's method." To this observation, however, the reply must be given that the underlying principle was only one, viz., that of producing a fistula between the anterior chamber and the subconjunctival tissue by means of prolapsed iris. The least efficient operation was the iridotomy with a tongue shaped flap of the iris from the periphery turned backwards into the wound, the fistula being formed by the pillars of the coloboma protruding into the wound; these were frequently too small to produce the desired effect (Lit. 2, Fig. 6, and Lit. 3, Fig. 22). At that time I purposely tried several procedures in order to find the best method. I now think that the best methods are the two shown in the text above (Fig. 1 and Fig. 3). I should have recorded this some time ago if I had not, in 1908 introduced the punch forceps in doing limbal sclerectomy.

B. *Iridencleisis cum iridotomia meridionali*: used for cases which have not been operated upon before. A subconjunctival keratome incision is made in the upper vertical meridian. The iris is seized with forceps at the margin of the pupil and drawn out so far that the upper border of the pupil appears outside the limbal incision. The assistant, by means of a blunt double hook (Fig. 2), draws down the conjunctival incision exposing the limbus; by this means the iris prolapse is laid bare.

The meridional iridotomy which includes m. sphincter is best

FIG. 2.

Dr. Holth's Double Conjunctival Blunt Hook (John Weiss' Catalogue No. 117; No. 121, Dr. Holth's Fixation Forceps, elbowed, is very useful for all keratome incisions upwards.)

performed with Wecker's iris scissors, both blades of which have blunt ends. The lower blade is passed under the margin of the pupil as far back as the periphery of the prolapsed iris, which as soon as it rests on the blade of the scissors is released from the grasp of the forceps and the incision then made by closing the scissors. By this means scraping of the pigment epithelium from the back of the iris is avoided. The sphincter corners then spontaneously slide back into the anterior chamber, so that the periphery of the iris only remains in and a little outside the limbal incision (Fig. 3). I have very rarely been obliged to cut away any

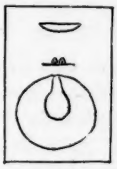

FIG. 3.

Iridencleisis cum iridotomia meridionali: used for cases which have not been operated upon before.

of the prolapsed iris tissue. The cut in the sphincter causes the original pupil, after re-establishment of the anterior chamber, to be considerably enlarged, and so optically nearly central (Fig. 3).

In the case of blind painful eyes in which the pupil is greatly enlarged in spite of miotics, I have, when the patient refuses enucleation, sometimes not made any incision in the iris but only left the edge of the pupil outside the limbal incision (Fig. 4).

It is this modification of my iridencleisis which J. Borthen calls "Iridotasis," an operation which I do not advise with a normally working m. sphincter in an eye with good vision, because the pupil

after the operation is drawn upwards, being displaced even to the limbus. The effect of these operations is not, as Mr. Borthen believes, due to opening up the corneo-iridic angle by the pulling upwards of the iris—because this angle in most cases is open already before the operation. By microscopical examination post mortem of 13 eyes even with very advanced chronic glaucoma successfully operated with iridencleisis, as in Fig. 1 or 3, I have found the angle open in all meridians though the traction on the iris by these two proceedings is almost *nil*. On the other hand, in glaucoma absolutum and acute cases the periphery of the iris is frequently pressed against the back of the cornea. The lowering of tension by the operations is due to the following facts: the iris tissue embedded in the limbal wound produces in the successful cases a fistulous opening lined with pigment epithelium; this opening brings the anterior chamber into communication with the subconjunctival tissue. I wish to draw attention to the micro-photographs of iris fistula after iridencleisis which I published previously (Lit. 2, Fig. 3, Lit. 3, Fig. 10 and Lit. 7, Fig. 1), as well as to a paper "Anatomical Examination of Six

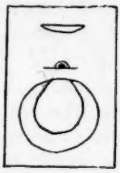

FIG. 4.

Iridotasis in glaucoma absolutum with a large pupil not affected by miotics.

New Cases of Subconjunctival Fistula Scars from five months to six years after Successful Iridencleisis or Limbal Sclerectomy in Chronic Glaucoma," which is shortly to be published in this journal. In other words, iridencleisis acts like limbal sclerectomy by the formation of a subconjunctival fistula. Lagrange (Lit. 9) designating colleagues who use iridencleisis "des operateurs qui n'ont adopté ni la théorie ni la pratique de la fistulisation" cannot have read my work of 1913 on the microscopical anatomy of fistula scars (Lit. 7). When, in connection with this, he suggests that the lowering of tension after iridencleisis is due to an iridocyclitis caused by the operation, I must answer him, on the basis of great experience, that he is utterly wrong, his only excuse being a complete ignorance of an operation which he has neither performed nor seen.

In my iridencleisis operations performed from 1904 to 1908 the subconjunctival incision was a bare millimetre from limbus (Lit. 3, p. 352). After 127 operations I had no case of late infection among seeing eyes, but I know of two cases of late infection after the lapse of many years in cases of glaucoma absolutum; one was mild

and of short duration. In 1915, when taking up again iridencleisis, I soon found that the best results, with regard to the permanent lowering of the tension were obtained when the subconjunctival oblique keratome incision in the sclera was made 2 mm. from the limbus (Fig. 1, 3, and 4). After iridencleisis with these peripheral subconjunctival incisions I have not yet seen any case of late infection; I believe the reason is that the conjunctival covering is thicker and has more blood vessels. I have had many good results of iridencleisis since 1915, among others, with a one-eyed colleague, who, four years after the operation, without miotics, has still V. = 5/5 and normal tension. I must, however, admit that in some cases the tension has not become quite normal, even after the resumption of miotics. For this reason I have not been able to restrain myself from trying to find a possibly still better operation.

The idea struck me that perhaps a more peripheral sclerectomy fistula would be better protected against late infection than one close

FIG. 5.

Holth's punch forceps, with blade 1 mm.* for tangential extralimbal sclerectomy. Made by John Weiss & Son, 287, Oxford Street, London, W.

to the limbus. The position of the sclerectomy close to the limbus could not be avoided in my two earlier operations with the punch forceps, removing pieces of sclera from the posterior or anterior lip of the wound (Lit. 5. Fig. 11 and 12; Lit. 6, Fig. 4 and 5). But by putting the 1 mm. wide blade of my new punch forceps (Fig. 5) into the anterior chamber in *tangential* direction from a short incision, 1.5 or 2 mm. from limbus, an *extralimbal* excision of the sclera can be obtained in the following way:

*This instrument is a modification of Dr. E. Forsmark's 2 mm. wide punch forceps for sclerectomy of anterior lip of the wound. I have reduced the width of the handles and of the blades to 1 mm. and made a change in the angle between handle and blade from 120° to 135°; by this alteration the handle can be lowered without the temporal orbital margin getting in the way; thus the tangential sclerectomy is made more peripherally. The model may be bought at John Weiss & Son, with 1.5 mm. wide blades; I used this model in the first tangential sclerectomies. Though I did not perceive any disadvantages, I believe, nevertheless, like Lagrange (Lit. 9) that a 1 mm. wide excision is more convenient to the topography of the field of operation (Fig. 7). Till now I have found this 1 mm. wide and 3 mm. long excision is as efficacious in lowering the tension to normal as the 1.5 mm. wide excision. I believe also that the narrower excision, which is naturally farther removed from limbus, gives the best protection against late infection.

Before the anaesthesia the pupil should be well contracted by miotics. A large curved conjunctival flap 10 mm. from the limbus with the apex somewhat temporally situated is dissected downwards to the limbus, but the ends of the incision should be at least 5 mm. from the corneal margin (Fig. 6).

An incision 3 or 4 mm. long is made into the anterior chamber; this is best performed with the keratome* ; the point of the knife is inserted 1.5 to 2 mm. from limbus and 3 mm. temporally to the vertical meridian. Before the point of the keratome reaches the chamber, the conjunctival flap is turned upwards from the cornea in order that the point of the knife may be seen in the angle of the chamber ; during this proceeding a good electric sidelight ought always to be used. In removing the keratome from the anterior chamber the handle is lowered and the point turned sideways ; in

A FIG. 6. B

Showing the incision in the conjunctiva and sclera in the right and left eyes—somewhat outside the upper vertical meridian. The *tangential* and *extralimbal sclerectomy* is shown at the inner end of the keratome incision in the sclera. A small basal iridectomy has been performed. Instead of a conjunctival flap a subconjunctival tunnel may be made to the limbus as in Fig. 1 or 3 ; then an assistant, by means of the blunt double hook (Fig. 2), draws down the conjunctival incision exposing the limbus for sclerectomy and basal iridectomy.

this way any danger of wounding the lens capsule is avoided. The operator now takes his stand behind the head of the recumbent patient whether the sclerectomy is to be made on the right or the left eye. The 1 mm. wide blade of the punch forceps is, with the flat part parallel with the sclera in tangential direction, introduced below the nasal angle of the wound 3 mm. into the anterior chamber. In order to make the scleral opening oblique and so place it farther from limbus, the handle is lowered till it forms an angle of about 150° with the plane of the iris (see the punctuated lines in Fig. 7).

*For all keratome incisions upwards I stand before the patient, hold the handle with palmarflected slightly supinated hand and guide the point towards me ; in removing the keratome I have plenty of free movement of the hand for lowering the handle and turning the point sideways in order to avoid any wounding of the lens capsule. By standing behind the head of the patient and holding the handle with dorsalflected and pronated hand, thus guiding the point from him, the operator has very limited hand movement (see W. Czermak "Augenärztliche Operationen," Wien 1893-1904, p. 10, Fig. 13). For all subconjunctival glaucoma operations the *blades* of the *speculum* ought to be *short* in *transversal direction*. By this means the palpebral fissure can be well opened in vertical direction and plenty of space be obtained for making a conjunctival flap or a subconjunctival tunnel.

The piece of sclera is now excised by closing the punch forceps; it should be 3 mm. long and the anterior edge should be placed rather more than 1 mm. from the limbus. A small basal iridectomy is then performed; but in some cases, such as where the iris has completely prolapsed, or in some cases of cataract, a complete iridectomy is done. The conjunctival wound is then sutured with three fine black silk threads which are tied only with the first half of a surgical knot and removed after forty-eight hours.

For the left eye the punch forceps ought to be held in the left hand if the operator stands behind the patient; but if he wants to use his right hand he should stand before the patient, preferably on

FIG. 7.

The punctuated lines show the position, limits, and direction of the tangential, extralimbal 1 mm. wide punch forceps sclerectomy; in the removed scleral piece is a little of canalis Schlemmii and of the ciliary muscle tendon, while the ciliary body itself is not laid bare.

the right side. If the keratome incision in the left eye is made to the nasal side, he may remain standing behind the patient and with his right hand make tangential sclerectomy to the temporal side; a protruding forehead would, however, during this proceeding present difficulties to the lowering of the handle of the punch forceps.

If the patient be a squeezer a transitory paralysis of the m. orbicularis after van Lint (1914) should be made previously by injection of a 2 per cent novocain solution with adrenalin freshly made with tablets. If the patient constantly turns the eye up, a transitory paralysis of the m. rectus superior may be made previously by injecting 0·5 ccm. of the same solution in the muscle (G. F. Rochat, 1920).

This operation, which I have used since March, 1920, has, up till now (August, 1921) yielded at least as good tension lowering results as my old sclerectomies or as sclero-corneal trephining. As

after all these operations, frequent appearance of post-operative transitory choroidal detachment is liable to occur and may last for four weeks, seldom more. Sigurd Hagen found it in 76 per cent. after Elliot's operation (Lit. 14, p. 171). I cannot state the frequency of this complication after the tangential sclerectomy, not having used the method of diagnosis discovered by Hagen (Lit. 14, Fig. 1 and 2), viz., increased transparence of sclera by electric transillumination a few days after the operation. I operated on a foreign colleague on December 20, 1920; a large bag-shaped temporal detachment of the choroid soon appeared. It had not altered when he left Christiania on January 18; on July 1 he wrote to me that the detachment had disappeared in the course of a few days about February 24, and that the sight of the eye had been excellent ever since.

Whether iridencleisis or sclerectomy should be performed in chronic glaucoma cannot easily be decided beforehand. After secondary iridencleisis I have several times obtained better results than I had obtained by any form of primary sclerectomy; in other cases, secondary sclerectomy has given the best results. I believe that the operator for glaucoma would do right in not forgetting either of these operations; but they should not be combined, an idea I suggested at Heidelberg in 1913 (Lit. 7, p. 213); the ophthalmic surgeon should study the results of each operation separately.

In primary acute glaucoma I prefer the classical iridectomy; only when this operation fails, and chronic glaucoma develops afterwards and is not influenced by miotics, I perform iridencleisis (Fig. 1) or sclerectomy as re-operation. In cases of chronic glaucoma with some acute phenomena, e.g., redness of the conjunctiva, hazy cornea and rainbows around the light, I have repeatedly had better results with iridencleisis (Fig. 1 or 3) than with iridectomy or any form of sclerectomy. In secondary glaucoma—mainly in iridocyclitis—neither iridencleisis nor sclerectomies give permanent results; iridectomy and medicamentous treatment are, as a rule, better.

The advantages of the tangential punch forceps sclerectomy are the following:

1. A short incision, 3 or 4 mm.; a shallow chamber does not form any contra-indication, as a very oblique incision does not prevent the tangential introduction of the 1 mm. wide punch forceps blade.

2. The scleral excision 1×3 mm. is made easily and quickly without any pressure on the globe.

3. The anterior wall of the scleral opening is parallel with the posterior wall (Fig. 7), the walls do not converge inwards as in my old sclerectomies.

4. The excision does not remove any cornea, it removes a piece of sclera only, including Descemet's membrane, the canal of Schlemm and some of the insertion of the ciliary muscle; it does not lay bare the ciliary body itself. (Fig. 7).

5. The defect is covered by thicker and better vascularized conjunctiva than in my old sclerectomies and has a similar advantage over the sclero-corneal trephining. I have not up till now seen the thin glassy bubble over the opening; frequently a flat cushion appears in the conjunctiva, with surrounding diffuse oedema; this is increased by massage, and both of them may disappear without any increase of the tension.

On these accounts I believe I am justified in hoping that late infections after the tangential extra limbal punch forceps sclerectomy will be very rare; time will show if they can be completely avoided.

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THE BARRAQUER OPERATION FOR CATARACT

BY

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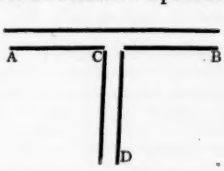
LONDON

I HAD the pleasure of seeing Dr. Barraquer operate in his own clinic at Barcelona in the spring of this year. His instrument acted beautifully. During my recent tour over the northern half of the American Continent, I saw it used by several excellent operators. We came to some very definite conclusions about the instrument and the use of it.

The principle of this instrument, raising a vacuum to a given tension and maintaining it at that tension without exceeding it, is perfect.

A Bunsen pump will do the same thing and will do it nearly as well. The great weakness of the instrument is that the valve is in the hand piece. This necessitates bringing the muscles of the forearm strongly into action, and maintaining that action in keeping the valve closed. This causes the operator to have a stiff wrist and to use the muscles of his forearm in performing the operation, whereas not a single muscle of the forearm should ever be used in a cataract operation. The muscles of the hand, alone, should be used if we wish to have the necessary lightness of touch and dexterity.

The valve should be foot controlled, not hand controlled. Th can be done by putting a metallic tube A—B in the middle of the rubber tube into which leads another open ended rubber tube C—D. The tube C—D can then be closed by squeezing it under the foot. A simpler method would be to squeeze the stout tube with the foot on the ground. The vacuum spoon should be straight in the shank and light, and should be put in at ten o'clock in the right eye and at two o'clock in the left eye, and not passed in over the forehead. The lens can then be dislocated by rolling the instrument between the thumb and index and middle fingers. If on the other hand it is passed in over the brow, the muscles of the forearm inevitably come into play in levering it out.



The chief thing which stimulates me to write this article is that I have heard complaints of an undue number of cases of detachment of the retina after the use of this instrument.

I am very anxious to assist any one who is trying to extract cataract in the capsule by any method.

If it is realized that the mechanics of this operation and of the one I have worked out are exactly the same, and the knowledge

properly applied, then we will hear less of such trouble as detachment of the retina.

In my method we put pressure on the lower third of the lens through the cornea and continue that pressure throughout at right angles to the anterior surface of the lens as it emerges. This causes the lens to swing round on its transverse axis. The suspensory ligament is thus ruptured first opposite the middle of the wound. The Barraquer instrument should grip the front of the lens and then be rolled between the fingers so as to do exactly the same thing. As used by some operators when it gets its grip it is made simply to lift forward the lens. By this means a temporary vacuum is produced behind the lens which *ipso facto* lifts forward the vitreous body, and hence dislocation of the retina or even of the choroid. When, however, it is made to roll on its transverse axis so as to rupture the suspensory ligament at the wound first, then air passes behind the lens and no such vacuum lifting the whole contents of the eye forward comes into action. This is the essential point to keep in mind when using this instrument. As to the range of adaptability of this instrument, it is not suitable for Morgagnian cataracts or cataracts with an easily ruptured capsule. On the other hand, such cases are as easily extracted by my method as any other class.

BILATERAL CHANGES IN THE CORNEAE FOLLOWING EXPOSURE TO COLD IN AN AIRMAN*

BY

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THE lesion here described occurred in exceptional circumstances and is of considerable interest as it is probably unique in ocular pathology.

An airman officer, V. V., of Messina, 23 years of age, started for an aerial expedition from a mountainous zone in April, 1917. After about an hour of flight he lost the left glass of his protecting spectacles, and two hours later lost the other glass as well. The aeroplane reached and maintained the height of 4,500 metres over mountainous country which was covered with snow. The airman stated that as soon as the left eye was exposed he felt a strong sensation of cold accompanied by lacrimation which, however, only lasted a short time. He had considerable difficulty in keeping the eyes open at first, but later could do so easily. The lacrimation

* From *Pathologica*, N 155.

had then ceased and the sensation was one of dryness with gradually diminishing visual acuity. This latter was so reduced that, on descending at the close of his expedition, he was unable to find his proper starting point, to which he should have returned, and was unable to distinguish any object with the right eye, and only with considerable difficulty with the left.

Examination, twenty minutes after his descent, gave the following result :—

Right eye. The cornea showed diffuse opacity like ground glass, most marked in the centre. The opacity was situated in the superficial layers of the cornea, the epithelium of which was slightly swollen in the centre and loosened, as in some eyes after the use of cocain. The iris could be made out and seemed normal in appearance and reaction. The corneal sensibility was not altered. There was some bulbar and pericorneal injection. Vision, 7/200.

Left eye. Condition similar to the right, but without the loosening of the corneal epithelium. Vision, 10/200.

The skin of the eyelids was normal, but there was frostbite of the first degree of the skin of the cheeks and nose.

On the following day there was still some alteration in the corneae; the corneal epithelium of the right eye was restored. Three days later both corneae were normal and full visual acuity had been regained.

Remarks

The lowest temperature to which the airman was exposed during his flight must have been about -25° C. This has been deduced both from questioning airmen and from the results published by Professor Gamba of the Aerological Observatory of Pavia.[1] This observer found with balloons that at the height of 4500—5000 metres the temperature was between 23.9° and 28.9° C.; the lowest temperatures being found in April, since the seasonal variation of temperature is later at a great height than on the earth's surface. Gamba's observations are in close agreement with those made by Teyserluc de Bert (Observatory of Trappes); H. G. van de Sande, Backhuyze (Tegel); Schmaus of Munich and de Marchi, for heights above 1,000 metres, so that the temperatures of the upper air do not seem to be much affected by differences in the geographical situation.

In the case here described owing to the flight being over snow-covered mountains the temperature must have been particularly low. An additional factor in producing the ocular lesions is to be found in the rapid movement of the air causing irradiation of surface heat and tending to lower it to that of the surrounding atmosphere, namely, about -25° C. Although evidence of the

admirable protection of the eye from traumatism from blows and foreign bodies is constantly brought to our notice, the same cannot be said of the mechanism of defence against extreme variations of the external temperature. From this point of view the thermo-regulating mechanism of the cornea is of chief importance, both because it is the most exposed part of the eye and also because, in the absence of blood vessels, it does not possess the protection afforded to other parts of the body by the circulation. The corneal temperature is maintained by irradiation from the neighbouring tissues, principally from the aqueous, the temperature of which is maintained by the rich plexus of vessels in the iris and ciliary body. v. Michel[2] has shown that the temperature of the aqueous is 7° lower than the rest of the body, while that of the cornea is 0.10° lower still. Hertel[3] has shown that applications of cold or hot compresses to the closed eyelids cause considerable variations in the corneal temperature; it is, therefore, reasonable to assume that perceptible variations must also occur in agreement with other external conditions. A complete corneal circulation has been discussed by Leber[4] and others and rejected, but even if it could be proved to exist it would be unable to neutralize the effects of marked variations in the external temperature. The lids with their dense vascular network, placed like a screen, play a notable part in the defence of the cornea, a defence that is perfect during sleep, and by no means negligible during the waking period, as it has been shown by v. Michel experimentally that forcible keeping open of the palpebral fissure lowers the temperature of the anterior segment of the eye and the aqueous. Winking increases when the need of defence arises and the palpebral opening may be kept half closed or even completely shut. The lacrimal secretion, the orbital arches and the nose also aid the defence against cold.

I have not been able to find any description of similar lesions to that described above as the result of exposure to cold. Kurizin[5] records a case of a man lost in the open country in Russia, owing to a sudden snowstorm, in whom exposure for a whole day resulted in frostbite of left foot and of nose and bilateral corneal ulceration. The ulcers penetrated down to Descemet's membrane and were symmetrically situated in the palpebral aperture. There was very little inflammatory reaction and they healed in about three weeks. The author thinks that they were really due to partial necrosis of the cornea from cold, an opinion supported by their symmetry, situation and clinical history. Kurizin's case differs from the one described above in the length of exposure and the impossibility of excluding traumatism from fragments of ice, etc., that may have been blown into the eye by the heavy storm. Dubois de Lavigerie[6] also records a case of bilateral lesions of the cornea which occurred in a cyclist during a winter race with

aviators. The lesions took the form of opacity without any superficial change, and were first noted after fifteen hours. Twenty-four hours later the corneae had completely recovered. In this case also mechanical causes cannot be excluded.

I consider that the sequel of events in my case can best be explained as follows:—As soon as the left glass was lost and while the airman was still at a comparatively low altitude, he must have felt the cold severely in that eye, but, by continual winking the freezing effect must have been considerably neutralized. Since the airman had an absolute and pressing necessity to see in order not to lose his way, his efforts, especially after the loss of the right glass, must have been constantly directed to keeping the palpebral fissures open. As the aeroplane rose the temperature fell and the analgesic action of the cold on the corneae made itself felt. Although we have no clinical evidence of any analgesic action of cold on the cornea we know that complete surgical anaesthesia can be obtained by freezing in other parts of the body, and we can assume that the same effect would follow in the cornea. As the corneae became insensitive the airman would have no difficulty in keeping his eyes open, thus depriving them of the normal protective mechanism. Other causes may also have contributed in producing the lesions found, such as the air resistance and the drying of the external surface of the eye from the rapid current of air caused by the aeroplane's flight. Under ordinary circumstances the necessity for increase of the lacrimal secretion can be readily met, so that, at first, increased secretion would take place which by its evaporation would aid the lowering of the corneal temperature. Later, the insensibility of the cornea would lessen the demand on the lacrimal secretion and the cornea would be insufficiently moistened, as was noticed by the airman, who said he experienced a sensation of dryness of the conjunctiva. What liquid did reach the surface of the eye must have rapidly evaporated owing to the rate of movement through the air. Further, the extreme cold also affected the vascular supply of the face and lacrimal glands. I also consider that the friction of the air resistance at the rapid rate of movement may have added some traumatic effect.

It is interesting now to conjecture what may have been the histological changes in the cornea that produced the observed changes. The fact that the transparency of the ocular structures is easily altered by cold had been previously noted. Thus in 1857 Kunde[7] observed changes in the lens of certain animals (frogs, pigs, etc.); similar observations were also made by Daddi,[8] Abelsdorf[9] and v. Michel.[10] v. Michel's observations showed that in living animals (cats, calves and others), and in enucleated human eyes the cornea and lens became opaque under the influence

of cold, while the aqueous and vitreous remained transparent, even when completely frozen. Haziness of the cornea begins to appear at 7° C., that of the lens at 6° C., increasing as the temperature falls, so that at −4° C. the cornea becomes like porcelain. As the temperature again rises the transparency is slowly regained, and is again lost if the temperature falls. In his experiments the transparency was normal twenty-four hours after the freezing. To understand the mechanism of this loss of transparency it is necessary to consider the chemical constitution of the cornea and lens. Both structures, although containing much water (76.6% to 76.9% in the case of the cornea, His, Leber), also contain a fair amount of albumin. The watery component is largely combined with the other chemical constituents of the cornea, as only one fifth can be extracted by evaporation methods. The other constituents consist in albumins and globulins (about one quarter of the total weight), and rather less than 1% of inorganic salts. The lens contains a rather higher percentage of organic material, nearly one-third by weight. The aqueous and vitreous are much richer in water and do not contain more than 1% of organic material. It is this chemical constitution that accounts for the loss of transparency in the cornea and lens, while the aqueous and vitreous are unaffected. According to v. Michel separation of the water takes place in the tissues that are richer in albumin, producing an alteration in the refractive condition without any modification of the anatomical structure. The conditions under which the airman was placed were similar to those of the experiments; it is, therefore, reasonable to assume that similar changes took place, especially when we consider that haziness of the cornea in animals begins at a temperature of 7° C.

As I have stated above, it is my opinion that the temperature of the airman's cornea, considering the diminished winking, was probably below 7° C., so that the alteration of transparency must have been partly produced by the chemico-physical change which involved, as in the animal experiments, the separation of the watery constituent and an alteration in refraction effect. But in my case definite anatomical changes also occurred in the corneal epithelium and parenchyma. These changes, particularly the desquamation of the corneal epithelium, I attribute to dryness owing to the insensibility and diminished lacrimal secretion. I feel assured that definite infiltration of the tissues took place since the opacity lasted 48 hours as opposed to the twenty-four hours found in animal experiments; all the more so when the length of time, three hours, during which the eye was exposed to the injury, and the readiness with which infiltration between the corneal lamellae and epithelium takes place are considered. I do not suppose it possible that appreciable anatomical alterations

could have taken place in the corneal lamellae on account of the relatively rapid and complete return to normal.

Summary

An airman exposed to direct action of cold and air resistance during a three hours' flight, suffered from bilateral corneal lesions characterised by ground glass opacity, most marked in the centre, and by epithelial desquamation. I consider that the lesions were caused by dryness and partly by separation, and possibly freezing, of the watery constituent of the corneae; partly, also by interlamellar infiltration with degeneration and desquamation of the superficial layers of the epithelium. The intense cold (about -25° C.) produced insensibility of the corneal surface which had lost its protection, and, also, of the anterior part of the eyeball, and thus facilitated the production of the lesions by allowing the airman to keep his eyes open without pain while diminishing the lacrimal secretion.

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ANNOTATIONS

Improvement of Visibility

It has long been known that much of the light reflected from a mirror is polarised, and it has been found in practice that the interposition of a Nicol's prism in viewing objects under water very materially improves visibility. During the war the Admiralty utilised this phenomenon in devising means to penetrate fog, for

the beamless searchlight, and other purposes. Instead of using a Nicol's prism, which absorbs a large amount of light, it was found better to use plates of plain glass placed obliquely at a suitable angle across the axis of the instrument. Sir William Crookes used lenses cut from quartz crystals perpendicular to the principal axis, thus utilising the rotary polarising effect of the material. The subject has been discussed recently in *Nature* (October 20 and November 10) by Professor C. V. Raman, Mr. A. G. Lowndes and Captain Sir David Wilson-Barker. Mr. Lowndes writes:— "I have lately been using tourmaline for obtaining a similar effect, and I have found that a very thin plate of tourmaline cemented as a semi-lens on to an ordinary pair of spectacles is best for this purpose." He finds that maximum polarising effect is obtained from plates cut parallel to the vertical axis. "Thin plates of this material, when so cut and fixed in spectacles" eliminate the injurious glare from water when fishing. "At the same time the eye is able to penetrate the water to considerable depths." "A further application is the manufacture of spectacles for invalids and others residing at the seaside, whereby, again, the glare of the water is almost entirely eliminated and the delightful tone of the tourmaline is very restful to the eye."

It seems desirable that ophthalmologists should be acquainted with this phenomenon, and that opticians should be encouraged to continue and extend the experiments.

The Antiquity of Trachoma

That trachoma, the scourge of mankind, is of very ancient origin is universally admitted. Dr. Charles Greene Cumston confirms this view in his interesting paper, "A Brief Historical Summary of the Treatment of Trachoma, with special reference to the Arabian School and the Writings of Ali Ibn-el-Aïssa (Jesu Hali)."* The early Egyptians treated certain forms of ophthalmia, including Trachoma, with the salts of copper—acetate, sulphate, carbonate, malachite, as well as with ferrum oxide. Hippocrates recognised the necessity of everting the lid and then of rubbing the internal aspect with the medicament smeared on clean thick wool wound round a wooden stick, thus anticipating certain modern methods of treatment. Celsus advised energetic massage of the granulations with a copper ointment having the consistency of honey, and Dioscorides friction with rough fig leaves or with a little scalpel, or with a sharpened bone of the cuttle fish, or with a pencil of acetate of copper. Aegineta everted

* Section of the History of Medicine, Royal Society of Medicine, May 18, 1921.

the lids and scraped the surface either with pumice stone, cuttle fish bone, fig leaves or with a special instrument in the form of a minute sickle with denticulated edges. Finally, the author quotes liberally from the translation into French of Ibn-el-Aïssa made by Dr. Haddoun, 1916.

In this connection it is of great interest to note that in the Ebers' Papyrus, which dates from the XVIII Dynasty in Egypt, i.e., about 1700 B.C., there is a prescription for the treatment of trachoma, in which the main ingredients are copper, myrrh and cypress seeds. Numerous other substances enter into the composition of the prescription, which was to be applied to the lids, after due incantations, with a goose quill. It affords definite evidence of the use of a copper salt at least as early as 1700 B.C. There is further evidence of the existence of a disease of the eyes, which was almost certainly trachoma, as early as the time of Khefu in the IV Dynasty about 3700 B.C. This Khefu was the great king known to the Greeks as Cheops, and was the builder of the Great Pyramid. He was the writer of the first known textbook of medicine.

The Interim Report of the Committee of the Ministry of Transport on Lights on Vehicles

The third interim Report of the Committee of the Ministry of Transport on Lights on Vehicles was issued last week; it is voluminous and full of diagrams.

The Committee state that the more recent improvements in headlights show such an improvement over the control of the beam as to "show a reasonable prospect of eventually affording a satisfactory solution of the problem." Their ideal being that any headlight which has a range of forward illumination in excess of 60 feet should have:—

(a) A minimum range of forward illumination of 150 feet and a maximum of 300 feet.

(b) A minimum width of 30 feet with a maximum height of 4 feet from the ground at 150 feet from the lamp.

(c) The lower edge impinging upon the road at not more than 50 feet from the face of the headlight.

(d) The field free from dark patches and the illumination reasonably uniform or having good gradation.

They also recommend, "In addition to the main beam there should be a field of diffused light with a range of forward illumination not exceeding 50 feet, or less than 25 feet, with a lateral divergence at the road surface of at least 20 feet at a distance of 5 feet forward from the face of the lamp."

They do not recommend any particular lamp, but there are several lamps now upon the market which fulfil these conditions more or less. To tide over the time when such a lamp can be perfected and come into general use they make the following recommendations:—

(*a*) Each headlight either to have fitted or attached in front of the headlight, or in front of the source of light, the mirror or any lens in the lamp, frosted or obscured glass, or some other suitable device, or to be mechanically adapted, so that when the headlight is correctly fitted on the car (or in an equivalent position) it shall not give a range of forward illumination in excess of 150 feet at any point more than 4 feet above the ground.

(*b*) The front of any such headlight, when viewed from any point more than 4 feet above the ground, to have a reasonably soft illumination throughout its whole surface without brilliant lines or points of light.

They further approve of headlights tilting downward, but together and only in a vertical plane. They rule against the use of additional moveable side lamps, but approve of an additional lamp for driving in the fog for the purpose of projecting the light on to the side of the road in a low position.

It is obvious from the report and from general knowledge there is yet to be found a solution of the "dazzle" problem. There is no doubt that some of the specially made lamps are an improvement and lessen the danger considerably.

The ordinary pedestrian walking along the road in the dark is perfectly able to take care of himself; the brilliant lights of the motor car being sufficient to warn him of its approach. The same cannot be said when two motor cars approach each other with brilliant headlights, but it is now becoming fairly general amongst motorists to turn out their headlights when passing each other so that the danger of either car running into anything during the time that the eye is regaining its dark adaptation is minimised. The turning out or dimming of headlights when motorists meet each other is, no doubt, largely for their mutual benefit, but frequently motorists do not turn out their headlights when meeting cyclists or other vehicles, and if this was practised far more, fewer accidents would result. It would be greatly facilitated by the fitting of an easily accessible "cut-out" to the steering wheel of the car.

The use of headlights in towns ought to be prohibited, as they are both dangerous and unnecessary.

ABSTRACTS

I—SCHOOL CLINICS

Harman, N. Bishop.—The organisation of school ophthalmic work. *Brit. Med. Jl.*, May 28, 1921.

Harman deals with this subject under ten headings.

1. *The discovery of the defect.*—While it would be desirable that all the children should be examined by experts, conditions of public finance render such a method impossible. Harman urges that the teachers should be instructed in the use of test types and in the detection of early signs of ocular defects.

2. *The measure of the work to be done.*—He estimates that the number of children needing medical attention for eye defects is about 20 per cent. In London with an average roll of 725,000 children, the average number of entrants in any year is 63,000, so that the minimum number of children requiring attention each year would be 12,600. The number of those requiring re-examination, etc., would probably about double this figure. The actual average numbers of children attending London school clinics for the years from 1912 to 1920 inclusive was 25,400.

3. *Treatment of defects.*—He urges that the clinics should be in close relationship to the schools so that the results of the treatment may be available for the guidance of the school authorities.

4. *Arrangements for school clinics.*—These will necessarily differ in town and country. In the country large clinics in constant work are not required, and the treatment is best carried out in the school premises by doctors who attend the schools in rotation on a plan prepared by the chief school medical officer.

5. *Following-up.*—Even where there are satisfactory arrangements for the following-up of children under treatment, the treatment or continuity of treatment is often neglected, much more is this the case where no such arrangements exist.

6. *Provision and repair of spectacles.*—Harman does not find it satisfactory that spectacles should be provided free of cost, since when that is done less care is taken of them. He suggests that some form of provident scheme might be worked for the benefit of such children as are likely to require glasses through life. A routine parade under the head teacher of the wearers of glasses would be of advantage, and one of the teachers with some mechanical ability might be found willing to make small adjustments of bent frames, etc.

7. *Staff.*—Harman considers it desirable that the work of inspection and treatment should be kept separate. He considers

that the treatment may well be carried out by private practitioners who give evidence of a competent knowledge of the work and will devote a definite part of their time to it, in preference to whole time school officers.

8. *Arrangements for special treatment.*—Harman feels the need of some form of institutional treatment for the various chronic cases, such as corneal ulcers, blepharitis, etc., a need which is not met by hospital out-patient departments. If such a scheme was adopted it would be necessary to be able to prevent the stupid class of parent from removing the child. He suggests that this difficulty might be met by the routine reporting of these cases as they arise to the local magistrates to whom fall the decision in school cases, so that their assent to treatment for a specific period might be obtained in advance.

9. *Children with serious defect of vision.*—About 2 per 1,000 of the school population have too low a vision for the ordinary curriculum. Special arrangements for their education under the Act of 1893 are not always taken advantage of owing to:—(1) the insufficiency of the provision, (2) the occasional objection of parents, (3) the lack of general knowledge on the part of medical practitioners of the nature and reason for special provision for these children.

10. *The influence of school medical work on the general community.*—Apart from the benefit to the children, Harman points out the educational value to the parents and to the general community of the knowledge of the necessity and possibility of the correction of ocular defects.

Harman's paper is a useful and sound contribution to an important subject.

E. E. H.

II—THE ECONOMIC ASPECT IN EYE INJURIES

Llewellyn, Dr. T. L.—The economic aspect in eye injuries. *Brit. Med. Jl.*, Jan. 22, 1921.

Dr. Llewellyn's paper is a very instructive one, and is based on an analysis of the total accident claims made on the North Staffordshire coal and iron owners during the past two years. Out of a total of 45,000 men there were in all 3,283 accident claims, of which 163 were eye injuries. This figure (5 per cent.) is in agreement with the figures given by Collis in his paper (*Ophthalmoscope*, Vol. XIII, p. 492). The 163 cases were divided into four groups:—

1. Cases returning to work.

2. Cases of serious injury necessitating immediate expert treatment at the infirmary.

3. Cases in which a comparatively trivial injury is followed by nystagmus.

4. Cases in which a slight injury, either through neglect by the patient or lack of expert treatment, is followed by serious and permanent injury to the eye. Five of these cases developed a severe attack of nystagmus.

Numerous illustrative cases are given, particularly of group 4, the most important group from the point of prevention. A useful set of rules for first aid attendants is given, and the author sums up the economic results of his series of cases as follows:—

"*Workmen.*—Forty-four men have lost the use of one eye and nineteen have developed nystagmus.

Settled for lump sum	19
Working full time	98
On half difference	11
Playing	35

Time lost at five turns a week, 17,250 shifts.

Employer.—Loss of output corresponding to time lost by workmen.

Expenditure in compensation, £8,286.

Liability of 68 unsettled cases.

It is the custom of employers to reserve a lump sum for unsettled cases. In the Yorkshire coalfield one mutual indemnity society has reserved nearly three-quarters of a million pounds for all unsettled cases (Gillhespy, Q. 5731, Workmen's Compensation Committee). The money thus put by is not available for the purpose of expansion of work, and is a very considerable drain on small employers."

E. E. H.

III.—PAPILLOEDEMA

Mills, A. E. (Sydney).—Papilloedema. *Med. Jl. of Australia,* Feb. 26, 1921.

Mills deals with the causes of increased intracranial pressure at considerable length in the paper under review. He favours the view that in the majority of cases the rise is due to increased secretory activity of the choroidal plexus. He quotes Halliburton in support of the arrangement of the substances that may act on the choroidal plexus in this way into three main groups.

1. Excess of CO_2 (or lack of oxygen in the blood), as in anaemia, and drugs which interfere with respiration.

2. The volatile anaesthetics, which may act by interfering with respiration or by altering the physical conditions of secretion.

3. Specific, and consists of an extract of the choroid gland or of the brain. The specific stimulant in these extracts is of the nature of a hormone, and probably acts directly on the secretory cells of the choroidal gland.

He points out that in destructive and rapidly growing cerebral tumours we have the conditions for the liberation of the hormone of group three, and that it is just in these cases that we meet with the highest degree of papilloedema. In addition to this specific hormone Mills considers that certain other substances whose nature is unknown have a similar action, and quotes four cases to illustrate the action of unknown toxins in producing papilloedema. He explains those cases in which, although marked papilloedema is present there is no great increase in the amount of cerebro-spinal fluid, as due to the increased tension of a normal amount of the fluid in the dural sheath obstructing the so-called lymph spaces or the cerebral veins or both channels. The increased intracranial pressure is then to be ascribed to the pressure of the growth itself. The absence of marked increase of cerebro-spinal fluid in such cases he attributes to the slow destruction of brain tissue, insufficient to stimulate the choroid gland to increased activity.

With regard to treatment, he suggests that it might be possible to expose the optic nerve within the orbit as in the removal of tumours of the optic nerve, and remove a portion of the sheath of the optic nerve. This he suggests would not only relieve the papilloedema, but would also allow the cerebro-spinal fluid to drain into the orbital lymphatics and so reduce the intracranial pressure.

E. E. H.

IV—CURIOUS INJURY TO THE EYE

Gibson, Dr. J. L. (Brisbane).—Hernia of vitreous into the anterior chamber. *Med. Jl. of Australia*, April 24, 1920.

Dr. Gibson's patient was a boy of 11 who had received an injury to the right eye five years previously which had necessitated the removal of an iris prolapse by the author. Recovery was satisfactory with good vision. On the second occasion the eye was struck by a gymnastic ring. Upon examination it was noted that there had been rather a broad rupture of the iris at its base inferiorly, but which did not quite reach the old coloboma. Through this rupture a jelly-like body had protruded into the anterior chamber, causing a narrowing of the pupil and coloboma. This was at first thought to be a partial dislocation of the lens. The author attempted to lacerate it with a needle, but then found

that he was dealing with the vitreous. The eye remained free from irritation and able to count fingers at some yards. The refraction was estimated as about emmetropic which confirms the supposition that the herniated structure was vitreous and not lens.

E. E. H.

V—OCULAR SYMPTOMS IN ENCEPHALITIS LETHARGICA

Pickard, Ransom (Exeter).—Ocular symptoms in the slighter cases of encephalitis lethargica. *Brit. Med. Jl.*, June 11, 1921.

Pickard here records a few cases in which diplopia, paresis of accommodation and retrobulbar neuritis, accompanied some mild cases of encephalitis lethargica. He sums up the symptoms observed as follows:—

"1. Paresis of the ciliary muscle is usually present, but is slight in degree and slightly different in the two eyes; from 1D to 1.5D being a usual amount. As the amount of manifest hypermetropia or presbyopia varies considerably in different patients under fairly similar conditions, it is not easy to state definitely the amount of paresis present; but in these cases the histories were fairly conclusive that there was paresis, and that this was slight. From the history it seems probable that the loss of accommodation was greatest very shortly after the onset, as was apparently the case with the diplopia, but no opportunity presented itself to verify this, for no case was seen earlier than the third day of the illness.

2. Paresis of the iris occurred in one eye of one case; it was of medium severity.

3. *Diplopia.*—This occurred in all the four cases given in detail, as well as in the five more casually mentioned. Three still had it when seen. Two of them had paresis of one muscle served by a branch of the third nerve, but Case II. showed a relative convergence not due to paresis of a muscle, for it was equal in all positions. It is better to assume that the convergence was really due to weakened divergence than to spasm of convergence. The onset of diplopia was sudden, but it became less severe after a few days, so that Case I thought it had gone when she visited me, though this was not so. When examined there was no obvious limitation of movement in the three cases; it required examination by a light and a red glass to demonstrate it, so that this symptom was in miniature.

4. *Optic neuritis.*—In Case II it was distinctly retrobulbar, with diminished central vision and field and enlarged blind spot. In Case I it is mainly retrobulbar, but has come forward to the

disc. But there is no projection above the surface, merely a filling up of the cup, the whole disc being white. The appearance of the vessels in the right eye as they emerged from this was quite unusual, as if they suddenly appeared out of plaster of Paris. Case III had a slight swelling in one part of the disc. Unfortunately the fields were not taken in this case. Case V had hyperaemia of the discs. His central vision was normal; circumstances prevented the taking of the fields. Thus, in these few cases, two had definite retrobulbar optic neuritis, and there was a suspicion that Case III and Case V had a slight degree of optic neuritis. As optic neuritis has not often been recorded, it may be accidental that so large a proportion of these present cases had it, as may happen with any special symptom in a small series; but it may be that this symptom is commoner than has been suspected, the state of the patients preventing the detailed examination necessary to establish the diagnosis of retrobulbar neuritis. Or perhaps optic neuritis may be frequent in the type of this disease existing in Devon. The few cases of optic neuritis recorded in France are summarized in *Arch. d'Ophtal.*, 1920, pp. 423 and 429.

In regard to geographical incidence, three of these cases occurred in Exeter, the remainder in North Devon. That these cases have come under the notice of an oculist raises the suspicion that there may be others, and that slight cases of this disease may be commoner than is at present thought.

It must be pointed out that the dominant symptoms in this group of cases—paresis of accommodation and sleepiness—are easy to recognize. To test the accommodation exactly may require special apparatus, but if a patient has difficulty in reading come on in two or three days, and this is associated with the other two symptoms, the practitioner will not go far wrong in assuming weakness of accommodation, and in establishing a prima facie case for encephalitis lethargica, notwithstanding the pitfalls which surround the subject."

E. E. H.

VI—THE ASSOCIATION BETWEEN ORBITAL AND NASAL DISEASE

Ingersoll, E. S. (Rochester, N.Y.) The effects of intranasal conditions on the ocular muscles. *New York Jl. of Med.*, April, 1921.

Ingersoll briefly reviews the anatomical conditions which underlie the close association of orbital and nasal disease. He divides the cases of muscular imbalance due to nasal disease into two main groups, the inflammatory and the mechanical, but admits

that the two groups overlap to a considerable extent. He excludes cases due to toxaemia in which the focus of infection is a nasal one.

The inflammatory group is taken to mean those cases caused by extension through blood vessels or lymphatics, or by direct continuity of primary nasal inflammation, and where the effect is brought about by inflammatory irritation rather than by the pressure of a gross pathological abnormality. He considers it probable that many of the external muscles hitherto referred to under the safely vague term of " rheumatic " are caused by direct irritation of the bodies of the muscles which lie close to the walls of the inflamed ethmoid cells. Even in relatively mild inflammations, the extreme delicacy of the separating partitions permit of the formation on the orbital side of a certain degree of periostitis sufficient to cause irritability of the muscle groups lying along the inner and outer walls, the most frequently attacked being the internal rectus, superior oblique, superior rectus and levator palpebrae.

The mechanical group usually presents less difficulty in diagnosis, although the cure may not be so easy. Periostitis, mucoceles, gummata and sarcomata are among the more common findings in this group.

Ingersoll gives notes of a few illustrative cases and pleads for a closer co-operation between the oculist and the laryngologist.

E. E. H.

VII.—SARCOMA OF THE IRIS

Teulières, M. (**Bordeaux**).—**Sarcoma of the iris.** (**Le sarcome de l'iris.**) *Arch. d'Ophtal.*, September, 1921.

" Leuco-sarcoma of the uveal tract is sufficiently rare to render each case of special interest to the pathologist, and yet sufficiently common to call for accurate knowledge on the part of the clinical observer."

As a primary growth in the iris this form of tumour is still rare; Lagrange, in 1900, found only 8 reliable records; Wintersteiner, in 1908, quoted 27 cases. Since that date one example has been reported by Lagrange and another by Fage. Teulières now reports a case, carefully observed and examined after removal, occurring in a man 65 years of age, who came soliciting advice in regard to spectacles. He was unaware of the existence of the tumour and had been quite free from any symptoms except failure of sight.

In his left eye was a brownish rounded mass nearly filling the lower half of the anterior chamber, and appearing to be incorporated with the iris. The lower two-thirds of its anterior surface were in contact with the cornea, which retained perfect transparency. Its lower border filled the corresponding part of the iris-angle, its upper border reached into the pupil, diminishing its area by about one-quarter. There was a complete absence of inflammatory signs, and of fundus lesions. V.=1/6. Tension by Schiötz tonometer was 35; by the finger test it was measured as $+\frac{1}{2}$.

The anatomical and histological characters of the tumour are shown in several photomicrographs. It proved to be a leuco-sarcoma, the brownish colour being explained by areas of pigment, entirely independent of the sarcoma elements, derived from the pigment-layer and pigmented stroma of the iris. The character and arrangement of the cell structure showed that the growth belonged to the endotheliomata, originating probably in the endothelium of the perivascular lymph spaces.

J. B. LAWFORD.

VIII—MISCELLANEOUS

(1) **Todd, Frank C. (Minneapolis)—Higher preparation in ophthalmology and oto-laryngology.** *Ophthalmology*, July, 1915.

(1) Following the widespread tendency to make provision for the higher education of those contemplating the practice of a specialty, the Medical School of Minnesota University has instituted a scheme whereby, after certain conditions have been fulfilled, a graduate may obtain a diploma which is a guarantee that he has undergone a certain amount of preparation for the practice of his specialty. The regulations apply to other specialties as well as that of ophthalmology, and the qualification conferred on the successful candidate takes the form of the degree of M.S. (Master of Science) in ophthalmology, in oto-laryngology, etc.

In the case of ophthalmology, the candidate must, after medical graduation, spend one year as resident in a general hospital, and devote a further period of two years to special study, the latter embracing both clinical and laboratory work, and before receiving his diploma he must present a report based on a piece of original research.

A. J. BALLANTYNE.

(2) **Phillips, William Linton (Buffalo).—The significance of the transparency of the retinal blood column.** *Ann. of Ophthal.*, July, 1915.

(2) **Phillips** considers that we may term a retinal blood column "transparent" when we can see an underlying venous column through an overlying arterial column, or *vice versâ*. This is not possible in healthy conditions, since the column of contained blood is then really opaque. When the vessels cross each other on the optic disc, we cannot place too much reliance on the test, since the pale colour of the nerve-head has then a tendency to reflect more light than the retina can, and thus the column may be made to appear more transparent. Transparency of the blood column was found 20 times in 600 cases, and in every one the haemoglobin content was below normal; it was restored to normal by appropriate treatment in 10 of the cases (those which remained under treatment), with the result that the column of blood then assumed its normal degree of opacity. Lack of transparency does not necessarily mean a normal condition, for we must take account of the possible presence of arterio-sclerotic changes. On the other hand, transparency, when present, does indicate that arterio-sclerosis is, at least, not advanced.

R. H. ELLIOT.

(3) **Allport, Frank (Chicago).—State legislation concerning the examination of school children's eyes, ears, noses, and throats.** *Ophthalmology*, July, 1915.

(3) According to **Allport**, seventeen of the United States have laws dealing with the examination of the eyes, ears, noses, and throats of school children. The principal details of these laws are quoted. Some of them refer to the eyes alone, while others embrace also the ears, noses and throats. In some States, the law makes these examinations compulsory, in others the law is merely permissive. In some the examination must be made by a medical man, in others, the work is intrusted to the teachers. The author, while admitting that the ideal arrangement would be to have the work entirely done by qualified medical examiners, points out the difficulties in the way, such as the expense, and strongly advocates the prosecution of the work with the aid of the teachers, believing that very reliable results can be obtained with a little preliminary training of the teachers with regard to the purpose and method of the examination, and by supplying suitably constructed charts and blanks for the purpose. He describes in detail the method which he, as Chairman of the Conservation of Vision Committee of the American Medical Association, has been advocating for some time, and which is now being followed in many parts of the United States.

A. J. BALLANTYNE.

(4) **Whale, Dr. H. L. (London).—Intranasal dacryocystotomy.** *Brit. Med. Jl.*, November 6, 1920.

(4) **Dr. Whale** advocates a more extensive use of some form of intranasal operation for certain lacrimal sac cases. He favours West's operation in which an oblong piece of bone consisting of a flimsy piece of the lacrimal bone and a tough piece of the nasal process of the superior maxilla is removed. If sufficient bone is removed the opening does not tend to close.

In his series of 25 cases, 63 per cent. were complete cures, that is no lacrimation in a keen wind; 25 per cent. failures, that is intermittent lacrimation even when indoors; and 12 per cent. partly cured, that is having slight epiphora only when out in a keen wind.

He admits that the West operation is possibly insufficient when some intraocular operation such as the extraction of cataract is required. The results obtained, apart from this consideration, do not seem to be a great improvement on what may reasonably be expected from a satisfactory external operation.

E. E. H.

(5) **Lodge, Dr. W. O. (Halifax).—Eclipse blindness.** *Brit. Med. Jl.*, May 14, 1921.

(5) **Dr. Lodge** records two cases of ocular damage resulting from looking at the recent eclipse through a piece of blue glass. Both patients were women of 42. In one there was an absolute para-central scotoma and a relative scotoma extending from it to the blind spot. Within the relative scotoma green objects appeared red and vice versa. There was also some metamorphopsia. Vision was 6/12 in both eyes, but the scotoma, etc., was only present in the right eye. In the second patient also only the right eye was affected. In this case there was a relative central scotoma for colours in which red was seen as green as in the previous case. This condition the author calls metachromatopsia, and defines it as the state of vision which imparts to an object the colour contrasting with that which it excites in a normal eye. In the second case the vision was 6/60, but only for a minute when it fell to less than 6/60 in the right eye, 6/10 in the left. There is no later note of the vision in either case than 14 days after the eclipse.

E. E. H.

(6) **Macdonald, Dr. Peter (York).—A case of sudden monocular dilatation of the pupil.** *Brit. Med. Jl.*, June 11, 1921.

(6) **Dr. Macdonald** records a case, sent him for investigation, to illustrate the importance of a full knowledge of all the facts before making a diagnosis. The patient was a lady, age not given, who had suddenly developed complete dilatation of the left pupil,

accompanied by supraorbital neuralgia, some apparent slight paresis of the upper lid and some nasal catarrh, after a cold motor drive. By the time the author saw her every trace of abnormality had disappeared. He suspected that some mydriatic had been used, but there was no history of any drops. After further questioning Macdonald found that she had been ordered by another practitioner some liniment for a sprained knee. This was found to contain belladonna, and gave the explanation of the mysterious attack.

E. E. H.

CORRESPONDENCE

MERCANTILE MARINE VISION TESTS.

To the Editor of THE BRITISH JOURNAL OF OPHTHALMOLOGY

SIR,—I shall be glad if you, or any reader of this Journal, will let me know what action the widowed mother of a cadet should take in order to recover the expense she has been put to in having her son trained on the training ship "Conway," under the following circumstances:—

On June 12, 1918, at Poplar, he was examined by Board of Trade in Form and Colour Vision—Exn. 16A—and given a certificate as having " Passed " in both. On completion of his training when presenting himself for examination by a steamship Company he was rejected owing to defect of vision of *one* eye. This defect is due to oblique hyperopic astigmatism of one dioptre, which was no doubt present when examined at Poplar, but not detected, as the candidate assures me he was examined with both eyes open.

Yours faithfully,
ARTHUR GREENE.

NORWICH, *October* 31, 1921.

AN APHAKIC HUMAN EMBRYO

To the Editor of THE BRITISH JOURNAL OF OPHTHALMOLOGY

SIR,—In an account of a condition of aphakia in a human embryo which I gave in this Journal last summer I implied that the condition of the central nervous system in that embryo was, so far as the indifferent condition of the embryo allowed one to judge, more or less comparable with that of a normal 13 mm.

embryo. I have had occasion lately to examine the brain of this abnormal specimen with greater care, and I have come to the conclusion that my first impressions were not correct. The brain is there, complete, but I am convinced that the folding of its walls is not due only to collapse consequent on its condition, but that there is also some dilatation of all the main cavities of this portion of the central nervous system. The cerebral vesicles moreover, although they are quite definitely and normally apparent in their hinder parts, do not seem to be properly formed further forward, though this appearance may be partly produced by dilatation of the telencephalon. The general structure of the brain tissue seems to be quite normal for its stage. The abnormalities of the central nervous system do not seem to be very great, but I think their existence should be put on record.

Yours, etc.,

IDA C. MANN, M.B., B.S.

THE INTERIM REPORT OF THE COMMITTEE OF THE MINISTRY OF TRANSPORT ON LIGHTS ON VEHICLES

To the Editor of THE BRITISH JOURNAL OF OPHTHALMOLOGY

SIR,—I would draw attention to the penultimate paragraph of the annotation in the present number of the Journal on the Interim Report of the Committee of the Ministry of Transport on Lights on Vehicles. The writer of the annotation says that when two motor cars approach each other with brilliant headlights it is becoming fairly general amongst motorists to turn out their headlights when passing each other so that the danger of either car running into anything during the time that the eye is regaining its dark adaptation is minimized. The real fact of the matter is that there is at present among motorists a perfect hullabaloo about the extreme danger of the present conditions, in which not only is there no definite rule as to this dimming or extinguishing, but also a wide divergence of opinion as to its advisability. It would not matter so seriously if the motorist's convenience were the only point in dispute. One may agree that the pedestrian can look after himself if he chooses to flatten himself against the hedge, but the greatest danger is to the cyclist unless he is prepared to do the same. Consider the conditions on a narrow dark road without a footpath. Two cars are about to meet with headlights on, so that the drivers, if they shade the eyes from each other's glare (which can often be done with the hand, the peak of the cap or some special device), can see everything that may be on the road. One of them extinguishes his headlights, and, as he passes the other

car finds himself in almost Cimmerian darkness and more or less dazzled and " disoriented." Now it is an unfortunate and very stupid fact that as the law stands at present the cyclist does not require to carry a rear light. What is to become of him if he happens to be just about the point of meeting of the two cars and travelling in the same direction as the one whose driver has extinguished his headlights and cannot see anything? A man with a wheelbarrow or a woman with a perambulator is in exactly the same predicament, to say nothing of the pedestrian and the dog, who are both unlighted. Owing to the present interregnum between D.O.R.A. regulations and the new regulations which will come in time, matters are worse than need be, but most of those who know the meaning of dark roads full of all sorts of traffic and possibly without footpaths have no use for switch twiddling courtesies. The latter may be good enough for town and suburban driving, but are in the highest degree dangerous on really dark roads.

Yours, etc.,

ERNEST THOMSON.

[A leader on this switching off of headlights was published in the *Autocar* of November 19, 1921, subsequent to the writing of above.—EDITOR.]

IMPROVEMENT OF VISIBILITY

To the Editor of THE BRITISH JOURNAL OF OPHTHALMOLOGY

SIR,—In the present number of the Journal I observe that there is an Annotation entitled " Improvement of Visibility," in which the polarization of light from reflecting surfaces is referred to. It may be a well-known fact, but, whether so or not, I have for long had the idea that polarization is the cause of the excessive skin bronzing which is associated with fishing excursions and sea voyages. Now, the point of this letter is that if such skin bronzing should turn out to be materially lessened or prevented by the wearing of tourmaline spectacles, we are going to have not only that rest to the eyes to which the writer of the annotation refers, but also two light patches about the skin of the lids which may give us when on holiday somewhat the appearance of the famous " white-eyed Kaffir," with this difference that whereas he had, I believe, one white eye, we shall have two.

Yours, etc.,

ERNEST THOMSON.

NOTES

Death.

WE regret to announce the death of Walter Lytle Pyle, who died suddenly at his home, Merrion, U.S.A., from a heart attack at the age of forty-nine years. He was a lineal descendant of Robert Pyle of Wiltshire, who went to America with William Penn, 1684. His early education was in the Philadelphia public schools, and he graduated from the Medical School of the University of Pennsylvania in 1893. After study in the hospitals and laboratories of London and Paris he returned to Philadelphia and specialized in ophthalmology and became Assistant Surgeon to Wills' Eye Hospital. He was a voluminous writer.

* * * *

Appointment.

DR. JOHN KIRK has been appointed Honorary Assistant Ophthalmic Surgeon to the Royal Eye and Ear Hospital, Bradford.

* * * *

Central Council for London Blind.

THE London County Council has now decided upon the constitution of a Council in aid of the Blind. It will consist of (*a*) one representative appointed by each of the nineteen Associations and Institutions in the London Area. (*b*) Not more than six persons selected by the London County Council with special knowledge of the needs of the Blind. (*c*) The Chairman and Vice-Chairman of the Special Committee dealing with Welfare of the Blind. (*d*) One representative appointed by the Minister of Health. (*e*) One representative appointed by the Board of Education. (*f*) One representative appointed by the Royal College of Surgeons of England. The County Council will appoint the Chairman annually. The Vice-Chairman will be elected by the Advisory Council. The Clerk to the London County Council will act as Clerk. All meetings will be held in private and all expenditure, after prior sanction, will be defrayed by the London County Council. Mr. J. Herbert Fisher, F.R.C.S., was appointed as a representative of the Royal College of Surgeons.

* * * *

International Congress of Ophthalmologists at Vienna.

THE Ophthalmological Society of Vienna recently arranged an International Congress in honour of the veteran Professor Ernst Fuchs. Neutral countries, as well as former enemies, the U.S.A., Japan, Italy and Latin America, were represented. Only Great Britain, France and Belgium sent no

delegates. So far as we can ascertain no invitation was received in this country. Meetings were held from August 3-6; forty-three papers were read and twenty demonstrations given in the Eye-Clinics of the University of Vienna. The proceedings were opened by an Address from Professor Fuchs.

The hundredth anniversary of the birth of Helmholtz, was the occasion of eloquent speeches by Professor F. Dimmer, Professor M. Marquez de Rodriguez, Dr. Gourfein, and others.

* * * *

Oxford Ophthalmological Congress.

THE next meeting of the Oxford Ophthalmological Congress will be held at Keble College, Oxford, on Wednesday, Thursday, Friday, and Saturday, July 5, 6, 7 and 8.

* * * *

The F.R.C.S. with Ophthalmology.

THE regulations for the F.R.C.S. with ophthalmology were approved and adopted at the meeting of the Royal College of Surgeons of England held on November 10. The examination, which will be held in June and December, comprises anatomy, physiology and optics in their relation to ophthalmology; clinical and pathological ophthalmology and ophthalmic operations. It comprises (*a*) two written papers; (*b*) a written and a viva-voce examination on patients; (*c*) operations; (*d*) viva-voce examination upon pathological and anatomical specimens and upon ophthalmology in general. Candidates must be Fellows, or have passed the second professional examination for the diploma of Fellow. They must produce evidence of having held the office of clinical assistant, house surgeon, or registrar for a period of two years at a recognized ophthalmic hospital, or in the ophthalmic department of a recognized general hospital. The last-named conditions may be modified in the case of a candidate (*a*) who holds, or has held, the appointment of (assistant) ophthalmic surgeon; (*b*) who has carried out original investigations; (*c*) who has written a thesis or published work; (*d*) whose studies or practice have extended over a long period. The fee for re-admission is ten guineas. A candidate who passes the examination will receive a certificate entitling him to describe himself as "F.R.C.S. (with Ophthalmology)."

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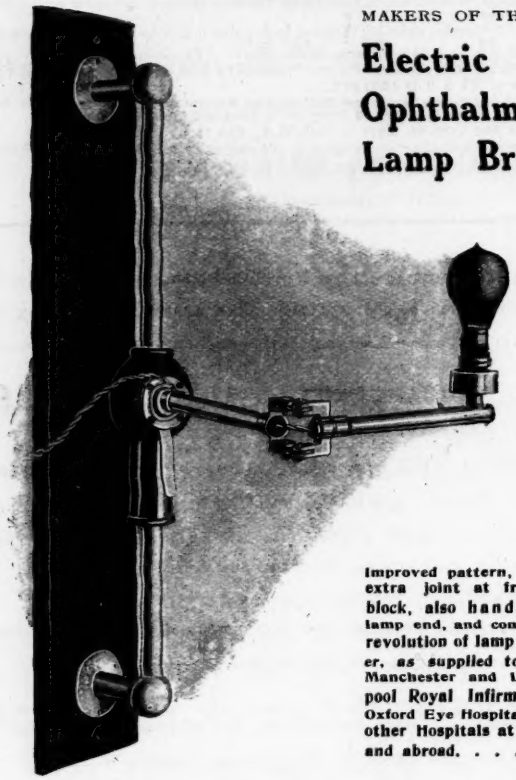

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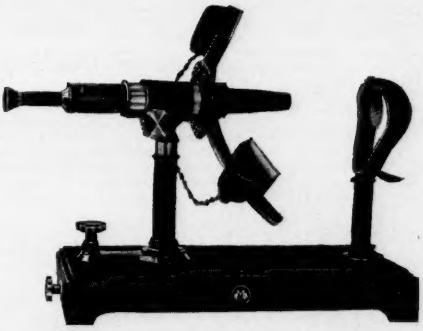

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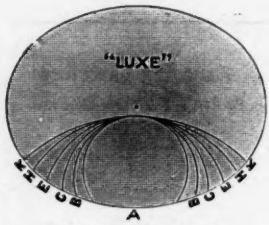

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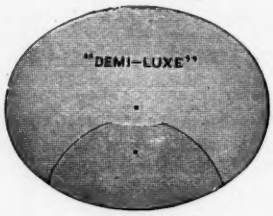

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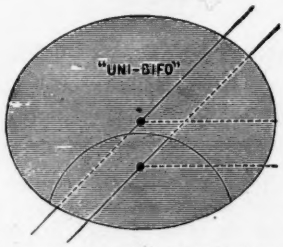

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